



THE CHARLES.

# A DESCRIPTION

OF THE NEWLY-INVENTED

# ELASTIC TOURNIQUET,

FOR THE

USE OF ARMIES AND EMPLOYMENT  
IN CIVIL LIFE.

ITS USES AND APPLICATIONS,

THE N. Y. ACADEMY  
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With Remarks on the Different Methods of Arresting Hemorrhage from Gunshot and other Wounds.

[T. S. Lambert]

"Simplicity, not complicity, of Surgical Instruments on service, is the object to be aimed at."—SIR JOHN HALL, *Inspect. Gen. of Hospitals, British Army.*

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## INTRODUCTORY REMARKS.

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THE loss of life is so natural a consequence of uncontrolled bleeding from a large vessel, that surgeons have, in all ages, looked with anxiety to an efficient means of restraining hemorrhage ; and the reflection that three fourths of those who die in battle, perish from the loss of blood, is a circumstance noways calculated to diminish this anxiety. The sad experiences of war give importance to all methods of saving life on the battle-field, whether immediately endangered by hemorrhage, or indirectly by shock and exhaustion. Indeed, no subject has taxed the ingenuity of surgeons more than this ; namely, to discover the best and most certain modes of arresting the flow of blood, in time to save life, where large numbers lie bleeding on the field, and where the aid of army surgeons cannot, of course, be immediately rendered. All who have had experience in war, as well as all writers on military surgery, testify that this is, as yet, a most important desideratum. "Hundreds," says Prof. S. D. Gross, "die on the field of battle from this cause. They allow their life current to run out, as water flows from a hydrant, without an attempt to stop it by thrusting the finger in the wound, or compressing the main artery of the injured limb. They perish simply from their ignorance, because the regimental surgeon has failed to give the proper instruction."—(*Military Surgery.* Phil., 1861.) These considerations, it is hoped, will cause the present effort in this direction to be received with all proper favor and indulgence.

It has been stated by some writers that bleeding from gunshot wounds is rare ; but this is not the teaching of experience. A majority of writers on military surgery express the opinion that primary bleeding always takes place if a vessel of any size is injured : and Sanson testifies to the constant presence of hemorrhage at the moment of injury. Macleod remarks, that "it is unquestionable that a large number of the dead sink from hemorrhage."—(*Notes on the Surgery of the War in the Crimea.* Lond., 1858.) Let us look at some of the results of this war. In an effective force of 145,000 in the French army, 7,182 soldiers were killed, and 325 officers ; while 35,912 soldiers were wounded, and 1,625 officers—making a total of 37,537 wounded, treated in ambulances. Sixteen thousand were killed, or died of their wounds, or after operation ; and a vast majority of them died from exhaustion, caused by loss of blood. There were 5,000 French soldiers wounded at the taking of Sebastopol ; and the proportion of very serious wounds, as compared with merely severe or slight, averaged one in 2.4. One in five died on the place of combat from hemorrhage. Of the wounds, one in 4.3 was in the upper, and one in 3.5 in the lower, extremities.

In the British army, during the Crimean war, the total number being 93,959, 2,598 soldiers were killed in action, and 157 officers, or 2.7 per cent. of the total force of men sent out, and 4.0 per cent. of the total strength of officers. Of the wounds, 30.2 per cent. were of the upper extremity, and 31.7 per cent. of the lower extremity. Sword, and lance, and bayonet wounds were comparatively rare, the vast majority being gunshot wounds. From the 1st of April to the end of the war there were 7,156 wounded treated, of which 4,436 were gunshot wounds of the extremities, of whom 254 died, and 2,526 were cured; 36 were bayonet wounds, and 7 sword and lance wounds; 126 miscellaneous. Of the immense numbers, both in the French and British armies, who were lost in the Crimean war, it is not too much to say, that multitudes who perished might have been saved if prompt and efficient measures had been taken to arrest the flow of blood soon after the wounds had been inflicted. The same remark will doubtlessly apply to large numbers who have fallen in the civil war now raging in the United States. By examining the accounts of the wounded in some of the regiments in the battle at Fort Donelson, Tenn., we find that a very large majority of those who were wounded, were wounded in the upper and lower extremities, where the prompt use of a proper tourniquet would have arrested the bleeding; while most of those who were killed outright, were shot through the head. Thus, in the Thirteenth Iowa Regiment, 14 were wounded in the lower, and 5 in the upper, extremity. In the Fourteenth, 11 in the lower, and 5 in the upper; 4 only in the body. Seventh Iowa, 15 in lower and 6 in upper; 4 in body, 6 in the head. Second Iowa, 35 were wounded in upper extremity, and 51 in lower; 8 in the body, 31 in the head.

To save the life of the soldier from instant danger on the field, when wounded, is a matter of such urgent necessity and grave importance, that it seems very remarkable that no more efficient measures have been recommended or adopted than those actually in use at the present day; and especially when it can be shown that thousands of lives have been unnecessarily sacrificed.

## NATURE'S METHOD OF ARRESTING HEMORRHAGE.

It is a well-known fact that nature sometimes stops the bleeding, even from arteries of considerable size. This is effected by the retraction of the artery, when perfectly divided, into the cellular tissue by which it is surrounded; at the same time the divided extremity contracts by means of its circular fibres so as to diminish the caliber of the vessel. This contraction, however, is not sufficient, if the artery be of considerable size, to arrest the flow of blood from the end of the vessel into the canal of the cellular sheath, which becomes stretched and uneven on its inner surface. The blood then lodges in these irregularities and becomes coagulated, thus diminishing the area of the sheath, and, at last, completely plugging it up; and this coagulation is assisted by the contact of the air, which is known to favor it, as well as stimulate the vessels to contract; also, by the diminished force of the circulation, and the increased plasticity of the blood, both the consequences of its loss, the blood stagnates in the vessel and forms a clot from its divided end to the next collateral branch, not, however, perfectly filling its area, and only slightly connected with it at its divided end. Coagulable lymph is poured out from this cut of the artery, and is deposited between the inner and outer clot, and thus closes the mouth of the vessel completely; at the same time, the end of the artery is connected to the surrounding parts by the exuding lymph, and is thereby secured against the pressure of blood. The artery, from its point of division to the nearest collateral branch, is gradually converted into a ligamentous structure, by which the canal is completely obliterated: the coagulated blood is absorbed, the lymph poured out in the adjacent tissues gradually disappears, and the parts resume their cellular condition. The same changes occur also in the end of the artery farthest from the heart. If an artery of any size be but partially divided, the bleeding is rarely stanchd by nature; when completely ruptured, as by the passage of a ball, the immediate loss of blood may not be very great, owing to the inner surface of



the vessel being torn and drawn together at several points, containing coagulated blood ; and if a large artery be merely punctured, an accident not likely to happen in war, the blood rarely flows through the external opening of the wound, but pours out between the artery and its sheath, where it coagulates and blocks up the opening in the vessel. The wound in the artery may be healed by the adhesive inflammation which is set up, or if not, an aneurismal sac may be formed by the pressure of the blood pouring into the sheath, which gradually increases and pulsates, but which disappears if pressure be made on the artery between it and the heart : or the tumor may be entirely dispersed by continuing the pressure for a sufficient length of time. Primary hemorrhage may not take place instantly on the receipt of a wound, but after a little time, when the faintness has gone off. Such cases are to be closely watched.

In very rare cases a longitudinal opening may be made into an artery, which may afterward heal, leaving no scar, the caliber of the vessel also remaining unobstructed ; but generally in a wound of any considerable artery, the canal is usually diminished by the outpouring of the coagulable lymph. Macleod remarks that "a considerable artery may be fairly cut across and give no further trouble beyond the first gush of blood, which takes place at the moment of injury. In such cases the vessel contracts and closes itself. If only half divided, as it is apt to be by shell, or by the quick passage of a ball, then the hemorrhage will be, in all probability, fatal." Larrey records cases, where one severe hemorrhage occurred at the time the wound was inflicted, which did not afterward recur, owing to retraction of the artery. Much will depend on the speed of the ball when it comes in contact with the vessel. If in full flight, it may divide it like a knife, and be followed by fatal hemorrhage.

#### ARTIFICIAL MODES OF ARRESTING BLEEDING.

Those employed on the battle-field, have usually been tourniquets, lint, bandages, compressed sponge, and styptics ; to these may be added, in civil practice, cauterization, torsion, and ligature.

*Compression.*—This is the only method, worthy of reliance, of

checking the flow of blood on the battle-field ; and it is not only the most reliable, but the most simple and easily practiced. It should be remarked that the blood from an artery, if it does not escape into the cellular tissue, spurts out in interrupted jets, bright red and frothy ; but if it comes from a vein it is of a dark color, and flows in an unbroken stream. Dark blood, however, may flow from the *distal side* of an artery completely divided. Arterial bleeding, which is by far the most dangerous, may be readily checked by pressure on the vessel between the heart and the wound ; but if it be venous, the pressure should be made on the opposite, or distal side of the wound. The bleeding may cease of itself, when small vessels only are wounded, or it may be stopped by styptics, or other artificial means. But whether the blood issues from a number of small vessels, or from a deep-seated wound penetrating an important artery, compression will be found to arrest it with almost equal certainty. But to be successful, it must be applied early, and steadily maintained until the surgeon can find time and opportunity to apply his ligature. At present we are, however, only concerned with it as a temporary expedient.

Compression of arteries may be *mediate* or *immediate*. An artery is mediately compressed, when pressure is made on it between the wounded part and the heart. The pressure may be made with the *thumb* or *finger*, the *tourniquet*, *special* and *graduated compresses*, and with *tightly drawn bandages*. Mediate compression is, for the most part, a temporary expedient, only resorted to till more suitable assistance can be obtained. As strangulation of the limb, which unavoidably attends compression by tight bandages, cannot be borne except for a short time, and as special as well as manual pressure can only be successfully employed by the surgeon, the *tourniquet* is the only mode of compression remaining, on which reliance can be placed on the battle-field.

### THE TOURNIQUET.

This well-known instrument, for stopping the flow of blood into a limb, until some requisite operation has been performed, or a more permanent plan of checking hemorrhage has been put in practice, has been employed for this purpose under various

modifications. The old surgeons used to surround the limb with a band, with which they made such a degree of constriction, that the circulation was quite stopped. They also believed that the pressure of the band was advantageous in benumbing the limb and moderating the pain of operations.

The violent pain and contusion, however, which such a tourniquet occasioned, being frequently followed by abscesses, and even by mortification, surgeons found it necessary to devise some other method for checking hemorrhage. The application of the insular band was first improved, so that it caused less pain and mischief to the skin. The limb was surrounded with a very thick compress, over which the band was placed. Two small sticks were next put under the band—one on the inside, the other on the outside of the limb—and they were twisted till the band was rendered sufficiently tight. A French surgeon, named Morel, is said to have made this first improvement in the application of tourniquets.

It is somewhat remarkable, that the instrument still employed in the field is either a simple strap, buckled around the limb between the wound and the heart, as in the Russian and Prussian service, and some other European armies, or a strap with a firm pad and buckle, or the old method of a simple cord twisted tightly with a stick. Indeed, in one of the best and most recent works on military surgery, the writer states, that "it is not necessary that the common soldier should carry a Petit's tourniquet, but every one may put into his pocket a stick of wood six inches long, and a handkerchief, or a piece of roller with a thick compress, and be advised how, where and when they are to be used. By casting the handkerchief around the limb, and placing the compress over its main artery, he can, by means of the stick, produce such an amount of compression as to put at once an effectual stop to the hemorrhage. This simple contrivance, which has been instrumental in saving the lives of thousands, constitutes what is called the '*Field Tourniquet*.' A pipe, knife, or ramrod, may be used if no special piece of wood is at hand."—(*"Military Surgery,"* by S. D. Gross, M. D., Prof. of Surgery, Jeff. Med. Coll.)

The obvious objections to this form of tourniquet are, its bulk and unwieldiness, its requiring constant attention, or some peculiar

contrivance to prevent the recoil of the stick, and consequent removal of pressure, and the impossibility of the patient applying it himself: and even in its modified form it cannot be relaxed and tightened with as much precision as is necessary; it compresses the whole substance of the limb, and cannot, therefore, be employed for any length of time, for fear of gangrene; it cuts off and prevents the collateral circulation, for want of which the limb perishes; it may, and often does, cause phlebitis; it usually causes an intolerable degree of pain, and, therefore, cannot be borne for any considerable length of time; and lastly, if employed in cases of amputation, by paralyzing the muscles it prevents their proper retraction. These objections apply to it even when modified, as it often is at the present day, by attaching to it a *pad*, to be placed over the artery, at the base of which is attached a ring, through which the strap is made to pass, a firm *compress*, or bit of curved horn or metal, to be placed over the opposite side of the limb to diminish the pressure; a *strap*, and something by which the loop may be twisted. Thus constructed, and the pad properly adjusted, the cap of metal is placed on the opposite of the limb, and the strap passed three or four times around the limb, and tied, or firmly fastened. Then introduce the lever through the loop, and rotate it until the requisite degree of pressure is obtained. The plates in the American edition of "Liston's Surgery," and Hamilton's "Military Surgery," show the different modifications of this tourniquet from the original "*garrot*" or "*Spanish windlass*," to the improved instrument constructed by George Tieman, of New-York. The most that can be said in favor of this mode of arresting hemorrhage is, that it is, perhaps, better than nothing; it may be useful in an emergency, when no better means are at hand, but should never be employed when a proper tourniquet can be obtained. But it can be made to appear, were it necessary, that the objections to the use of this instrument, already alluded to, will apply with greater or less force to all the tourniquets hitherto introduced either in the army or civil service.

The following remarks of the late eminent surgeon, George McClellan, M. D., of Philadelphia, the father of General McClellan, now at the head of the U. S. Army of the Potomac, are too



important to be omitted in this connection :—" Hemorrhage is the most serious of all the complications of gunshot wounds. *More lives are lost from it, either directly or indirectly, than from all the other circumstances combined.* The usual practice, on the field, is to check it immediately by the application of a tourniquet, or some extemporaneous substitute, which answers a temporary purpose, at the expense of a most injurious congestion of the wound and all the parts below. When, after a long delay, and, perhaps, transportation of the sufferer to a distant rendezvous, the strangulating ligature is removed, and the bleeding orifice sought for, the most embarrassing difficulties have to be encountered by the operator, from engorgement and coagulation of blood, among the injured parts. Even provided the wounded artery then be found, and successfully tied, the most unfavorable condition of things will be presented for the restoration of a sound circulation, and reparatory efforts among the injured parts. In hot weather, especially, vascular engorgement, tumultuous excitement, and mortification, are insured by such a rude and mechanical treatment. The surgeon would, in general, do vastly better by leaving the wound in the hands of nature, under such circumstances, and endeavor to assist the propitious syncope by maintaining the head and shoulders, for a while, in an elevated position, and applying cold fomentations to favor contraction of the vessels and coagulation of the blood, than injure the vitality and organization of all the textures in the wounded limb. There can be no doubt of the superiority of the French practice on the field of battle, as instituted by Larrey, to take up the wounded arteries at once by a prompt operation, if the severity of the hemorrhage appears to require it."—(*Princ. and Prac. of Surgery.*" Phil., 1848.)

The force as well as truth of these remarks will be acknowledged by every surgeon who has seen the effects of the common field tourniquet, when applied for any length of time ; and no one will hesitate to agree in the opinion, that it would be far better to leave such cases in the hands of nature. But in regard to the French practice, or rather that recommended by Larrey, of tying the arteries at once on the field, it has never been carried out, on account of its impracticability. Where numbers lie wounded and

bleeding, some temporary expedient must be resorted to, to check the bleeding, until they can be removed to some safe and convenient place for the surgeon to operate. These means must, of necessity, be for the most part, in the hands of other persons than surgeons. Even in the British army, where there are 56 surgeons, including 14 dispensers, to a Division of 10,000 men, or one surgeon to 178 soldiers, instead of one to 500, as in the army of the United States, such a practice as that recommended by Larrey, has been found wholly impracticable.

All other tourniquets in use are only modifications of this original instrument of Morel; such as Petit's or the "Screw Tourniquet," the English and French field tourniquets, the "Clamp" or "Horseshoe Tourniquet," "Dupuytren's Compressor," "Charriere's Tourniquet," "Skey's," "Oke's," "Moore's," and "Tyrrell's" tourniquets, etc. As these are all unsuited to, and never employed in armies in the field, we need not dwell on them, especially as they are described in many accessible works on surgery, which also contain illustrative plates of the same instruments. Moreover, the same objections apply to nearly, if not all of them, as to the common field tourniquet, already considered.

#### PETIT'S TOURNIQUET.

The tourniquet of Petit is not only the instrument usually employed in operations on the extremities, in ordinary civil, but it has also been recommended for field, use. It consists, as is well known, of two plates regulated by a screw, a strap and buckle, and a compress. In choosing this instrument, it is important to see that the teeth are perfectly round; otherwise, as soon as the screw is tightened, the edges of the tongues will cut the strap, and thus prevent the necessary constriction of the limb. In applying it, the plates are to be placed in contact, a firm compress laid over the part of the vessel to be compressed, the pad upon this, and the frame (beneath which a firm compress should likewise be introduced) upon the upper or outer portion of the limb, so that it can be readily managed. The instrument is tightened by turning the screw, which separates the plates, and relaxed by bringing it back by reverse turns toward its first position. This

tourniquet is altogether unfitted for use on the battle-field, as it cannot be applied with facility, nor by the wounded person himself; and as generally employed, even by the surgeon, it is apt to arrest the circulation in the whole limb, or cause phlebitis. Even in ordinary cases of amputation, there are so many objections to its use, that surgeons have very commonly laid it aside, and trusted to compression of the artery by the thumb of an assistant. The remark, however, of Liston will ever hold true, viz.: "That no surgeon, when about to perform a capital operation, should rely upon this method alone; for his assistants may become fatigued, or nervous, or may apply the pressure irregularly, and thus place the life of his patient in jeopardy. Hence, there ought always to be at hand a tourniquet, or compressor, or something of the kind."

It is remarked by Macleod in his "*Notes on the Surgery of the War in the Crimea*," that it has been the experience of most wars, certainly of the late one, that tourniquets are of little use on the battle-field; for though it is unquestionable that a large number of the dead sink from hemorrhage, still it would be impossible, amid the turmoil and danger of the fight, to rescue them in time; the nature of the wounds in most of these cases causing death very rapidly."—(P. 127, Am. Ed.) This may be true as regards the tourniquets in present use in the British and French, as well as in the American armies; and, indeed, the writer was informed by a brigade surgeon, who was at the battle of Bull Run, where more than two thousand were wounded, that the use of the field tourniquet was so frequently followed by mortification and the loss of the limb, that he had come to the conclusion, that it was far safer to leave the wounded to nature, without any attempts to arrest the flow of blood, than to depend on the common army tourniquet. It may be, and probably is, true, as a general rule, that where large arteries are wounded, death is apt to occur very speedily; but both Larrey and Colles relate instances in which, by prompt assistance, death was prevented in wounds opening even the carotid artery. Equally prompt assistance would, no doubt, prevent a fatal result from wounds of the femoral, brachial, and other large arteries.

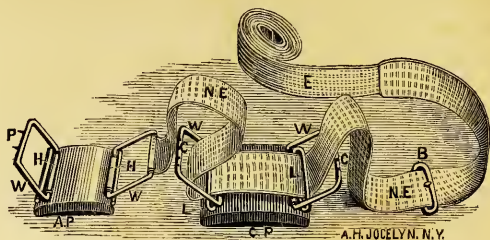
## THE ELASTIC TOURNIQUET.

The newly invented ELASTIC TOURNIQUET—known as “Lambert’s Tourniquet”—is believed to possess very important advantages over all other instruments of the kind, for the use of armies in the field, and also, for all the ordinary purposes for which any tourniquets are ever employed. Such is the opinion of the most eminent surgeons in the United States, as may be seen by referring to the testimonials in the Appendix. These are selected from a large number, and it is presumed will be considered as decisive in regard to the merits of the new invention. It is not expected that it is about to create a new era in the history of military surgery; but it is believed that the extensive introduction of the new tourniquet into modern armies, in sufficient quantity to supply the wounded, will greatly diminish the number of deaths in proportion to the wounded, and thus save thousands who otherwise would perish. This instrument had not its origin in any mercenary or selfish considerations, but in a sincere and heartfelt desire to discover some more available and successful method of arresting the flow of blood on the battle-field than those in general use. It is the fruit of much thought, and many experiments; fifteen different forms and modifications of the instrument were constructed before it took its present shape. Though pronounced perfect by some excellent judges, it is very possible that it may be found susceptible of improvement. It is, however, claimed for it, that under its present form, it is far superior to any other contrivance hitherto introduced for the same purpose. The recent adoption of this tourniquet by the United States Government, and its introduction into army use as a *field tourniquet* by Surgeon-General Finley, under the advice of a board of experienced army surgeons, especially convened to decide upon its merits, (and who reported unanimously in its favor,) must be regarded as very satisfactory evidence of its superior excellence, and its adaptation to the end in view. A slight examination will show that it is no less well adapted to civil, than military use.

The *Elastic Tourniquet* may be described as consisting of two concavo-convex pads of plate tin, the larger, (see plate,) CP,



$2\frac{3}{4}$  inches in length, and 2 in width; the smaller, AP, is 2 by  $1\frac{3}{4}$  inches. These pads are connected by a piece of non-elastic webbing,



NE, about 21 inches in length, and  $1\frac{1}{2}$  inch in width. They are furnished also with wings, W, to take off all pressure from the limb, except where the pads are placed. These wings are attached by hinges, to facilitate compact packing. The inelastic band, NE, is attached by one end to the narrower wing of the smaller pad, while the other end passes over the wings of the other pad, and under its loop, L, and then through a buckle, and is attached to the elastic band, E; the counteracting pad, CP, should be opposite to the arterial pad, AP; hence CP is movable on the inelastic band, NE.

To apply the tourniquet, place the small pad with the pointed wing up, over the artery to be compressed; slip the large pad on the band, so that its wing nearly touches the wing of the small pad, as in fig. V; then bring it upon the limb, till opposite to the small pad, as in fig. 6; then pass the band through the free or pointed wing, P, of the small pad, and draw up the band till snug, where it may be held by the points, or it can be passed through the buckle, and there fastened. It can be readily drawn tight enough to arrest the current of blood by these means alone; but it is better to merely draw the inelastic snug, and let the points hold it; then pass the elastic band around in the direction shown in figs. 3, 4, 7, and fasten the end by tucking it under one of the turns. The power with which the elastic will act, will depend upon its tension. If the greatest power is required, it should be put around and stretched to its utmost; but usually two or three turns, moderately stretched, will be sufficient. If the flow of blood be so

rapid as not to permit the application of the pads at first, the elastic alone, wound around, well extended, will stop the flow, and can be applied in an instant; after which the pads of the same tourniquet can be properly applied.

In some instances a piece of compressed sponge, or a compress, may be applied directly to the wound, and confined there with the smaller pad, with the usual effect of arresting the hemorrhage.



THE ACCOMPANYING PLATE SHOWS THE TOURNIQUET WHEN APPLIED TO THE  
ARM OR LEG.

When it is desirable that the smaller pad should be convex, a common bandage roll can be easily applied and fastened either across, or in the direction of the artery, by a few turns around the limb; then place the pad over it, and make compression as before. A little practice will enable any person to apply this instrument with entire success to his own limbs, it being readily adjustable to any requirement. When it is desirable to make pressure on the main artery of the arm, to arrest hemorrhage from any part below, the person may be very safely guided by the inner seam

of the coat, at the upper part of the arm, a little more in front near the elbow; while half-way between the inner seam of the pants and the top of the thigh, at its middle, is a good guide for making pressure upon the main artery of the lower extremity.\*

#### USE OF THE ELASTIC TOURNIQUET ON THE BATTLE-FIELD.

The advantages of this tourniquet over all others hitherto in use, are obvious upon slight inspection. They consist in its simplicity of construction; its ready adaptation to the limb, even by the wounded person himself; its perfect security and efficiency; the comparative ease with which it may be borne for many hours, or even days, if necessary; its non-interference with the collateral circulation, which goes on as usual, thus not endangering the loss of the limb; and, lastly, its freedom from any danger of exciting inflammation and suppuration, or phlebitis, so often caused by the ordinary field tourniquet. Although it is believed to be more especially adapted to the field, yet it is remarkably well adapted, also, to the treatment of aneurism by compression, as well as to ordinary cases of amputation, etc.

The question naturally presents itself, in connection with this instrument, how many of them should be supplied to an army in actual war? Besides the few field tourniquets in the hands of medical officers in each regiment, each soldier in the Russian, Prussian and Austrian service, is furnished with *a simple strap and buckle*, with directions to apply it firmly on the limb between the wound and the heart, in case of a wound attended with hemorrhage; and in the British army, in the Crimean war, each medical officer, (according to Sir John Hall, "Inspector-General of Hospitals,") or his orderly, carried *three or four tourniquets* along, "to restrain any alarming hemorrhage;" while "each soldier *was fur-*

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\* *To fold up the instrument so as to be contained in the box:* slip the large pad on the non-elastic within three or four inches of the elastic; then wind the elastic (the wings being closed) twice around the large pad, holding it all the while in the left hand; then bring the concave surfaces of the two pads together, and fold up the non-elastic, and fit it snugly within and over the wings of the small pad; then wind the elastic around both pads, and tuck under the end, when it will be found to fit the box.

*nished with a bandage and piece of lint*, as part of his equipment, and these he was directed to carry about his person, so as always to have them ready for use in case of their being required." This provision, it would seem, was the main dependence in the British army against sudden death from bleeding of wounds on the battle-field, for the number of tourniquets provided was wholly inadequate. According to the British Army Regulations, the supply of tourniquets for a division of 10,000 men, for three months, is as follows:—Two Signorini's tourniquets, forty field tourniquets, and ten screw tourniquets: total, fifty-two; or one tourniquet to 176 men. This shows that the main reliance, as a temporary expedient, was the bandage and lint. Moreover, it is not easy to see how these are to be successfully applied by the wounded soldier himself. Nor need we dwell on the great danger of cutting off the entire circulation of a limb by an inelastic strap or cord, or by the ordinary tourniquet at present in use in the United States army. We are aware that there is a very general prejudice among army surgeons against all tourniquets on the battle-field; and this arises from the fact that so many limbs, if not lives, have been lost from the entire strangulation of the limb, and the severe pressure applied by the pad. These results, however, it is confidently believed, are avoided by the use of the Improved Elastic Tourniquet. A few simple directions from the regimental surgeon, or assistant, will be sufficient to enable any common soldier, of ordinary intelligence, to apply the instrument successfully to either the upper or lower extremity, in case of being wounded; and then it may safely remain on the limb for hours, if necessary, before the vessel is secured by ligature. Hence, Dr. Mott remarks that "the value of the invention is, that the wounded man himself can apply it. The common tourniquet, the stick and clamp tourniquet, require a second person to assist in their application, and before this can be rendered an abundance of soldiers have, and will continue to perish from the loss of blood. While the circulation through the principal arterial channels is interrupted by this instrument, the collateral supply will go on to a sufficient extent to prevent the limb below from perishing. Every officer in our army, from the lowest grade to a general, should have one, and at

their leisure moments teach the men of their regiments how they are to be applied."

#### THE USE OF THE ELASTIC TOURNIQUET IN THE TREATMENT OF SECONDARY HEMORRHAGE.

Secondary hemorrhage is of not unfrequent occurrence after gunshot wounds ; but we have no reliable statistics to show what is the number absolutely or proportionably to the whole number of the wounded. A very proper distinction has been drawn between *secondary hemorrhage*, proceeding from sloughing and ulceration, and that from increased arterial action, which occurs at different stages of the treatment. The first kind, viz., that from sloughing, occurs, of course, at a comparatively late period. Guthrie says from the 8th to the 20th day ; Dupuytren from the 10th to the 20th ; Hennen from the 5th to the 11th ; Roux from the 6th to the 20th ; Macleod from the 5th to the 25th, but most usually about the 15th day after the injury.

Consecutive or secondary hemorrhage may arise from small vessels, and be easily arrested ; or, it may spring from a large vessel, and prove suddenly fatal. No one severely wounded by gunshot, can be considered safe till the wound is healed. In such cases, the military surgeon is directed by Bell, Guthrie, and other writers, to tie both ends of the bleeding vessel, as the best mode of checking the hemorrhage. But if the bleeding occurs at a late date, as Macleod has remarked, the limb is so much swollen, its tissues infiltrated, matted together, and disorganized, that it will be found difficult to do this ; and the artery, moreover, is apt to be in an unnatural state in suppurating wounds, as recently shown by Nelaton. Here *compression* comes in as an indispensable temporary expedient, whether the trunk, from which the bleeding proceeds, has to be tied or not. It is for such cases that Sir John Hall (Inspector-General of Hospitals during the War of the Crimea) recommends that "Compressors" should be supplied to the army ; and he remarks, "These are frequently of great value in suppressing secondary hemorrhage, when the common tourniquet could not be used without injury, and where ligatures are applied with difficulty and uncertainty." Here the Elastic Tourni-



quet will be found to possess important benefits over any of the "Compressors," so called, whether "Coste's," "Dartnell," or "Charriere's," etc.

Again, there are cases where there is obstinate hemorrhage from stumps after amputation, which is treated by some surgeons, by tying the main artery above the extremity of the stump; but usually with unfortunate results. Macleod recommends, as a mode of practice supported by very extensive observations, that well-applied pressure should be made on the principal vessel, so as to diminish the circulation through it; and this he pronounces the most successful treatment. This pressure is very generally made in the British army practice, by the common screw field-tourniquet, shifting the compressing force carefully from time to time. The objections to this instrument, as a mode of making pressure to any length of time, we have already considered. It is sufficient to add, that they do not apply to the new American Tourniquet.

#### USE OF THE ELASTIC TOURNIQUET IN AMPUTATIONS.

The tourniquet has been laid aside by some surgeons of late years, in amputations of the thigh and arm, and compression by the hands of an assistant substituted. In the lower extremity this is done by pressing the femoral artery against the brim of the pubes, and in the upper extremity by compressing the sub-clavian against the first rib, or the brachial against the shaft of the humerus. Erichson advises that the pressure should be made by grasping the limb with one hand in such a way that the index and middle fingers bear upon the artery, and press it directly against the subjacent bone; and if the limb be large, or if long continued pressure be required, the same fingers of the other hand should be firmly applied upon those that are already compressing the vessel. But the same writer remarks, that "in most cases, in which temporary compression of the artery is required, *the tourniquet should be employed*. It is far safer to trust to this instrument than to the hands of an assistant, however steady and strong. When the tourniquet is applied with a sufficient degree of tightness, the whole circulation through the limb may be completely arrested. *This can never be done solely by the compression of the main*

*trunk*, the collateral and minor supplying vessels conveying blood into the limb independently of it. Then again, if the operation be unexpectedly protracted from any cause, the fingers of an assistant may tire or stiffen, and, by relaxing the steadiness of their pressure, allow hemorrhage to ensue. For these reasons, surgeons almost invariably employ the tourniquet in amputations; and even the late Mr. Liston, who, at one period of his career, discarded this instrument, commonly employed it during the latter years of his life."

Erichson recommends that "Petit's Tourniquet" should be employed in these cases; which consists, as we have seen, of two plates attached to a band that is buckled round the limb over a pad that has previously been applied above the artery to be compressed. In applying this tourniquet, we are directed to take especial care not to screw it up till the very moment that the compression is required, and then to do so quickly and with considerable force, lest venous congestion of the limb take place, by the veins being compressed before the circulation in the arteries is arrested. It is obvious, however, that this cannot be effectually done, where the screw tourniquet is employed, as too long a time elapses before the artery is effectually closed; whereas, in using the "Elastic Tourniquet," the compression of the vessel is instantaneous. If it is desirable to compress the collateral vessels, and thus entirely command the circulation, the instrument should be employed *without expanding the wings*, when the object will be perfectly attained; or, the larger pad may be detached entirely by slipping off the band; then, placing the smaller pad over the artery, surround the limb with the elastic, and draw it suddenly with force enough to compress the vessel. To ensure perfect security, the band should be passed three times around the limb, and secured in the usual manner, by tucking under its end, or fastening by the buckle.

Dr. Reese, the late able editor of the American edition of Cooper's "Surgical Dictionary," objects very strongly to the use of the tourniquet in amputations, as calculated to increase the quantity of blood lost, and remarks that many American surgeons, on this account, dispense with its use altogether. "On the first

application of this instrument to the thigh," he remarks, "the compression is made on the superficial veins, the return of the blood prevented, and the morbid state of the limb often favors the consequent engorgement. *As the instrument is screwed*, the turgescence of the limb below the point at which the compression is made, continues to increase until the circulation is stopped. No sooner is the incision made, than a hemorrhage of a very considerable extent takes place, and the assistant is directed to tighten the instrument, which fails to suppress it, because the blood flows from the vessels of the limb below the incision, thus unnaturally distended. Every operative surgeon must have suffered inconveniences, and often anxiety, from this source, and yet few have blamed the tourniquet, which is the true cause of the mischief." The employment of the "Elastic Tourniquet" obviates all these objections, which are to a great extent well-founded, when any of the ordinary tourniquets are employed, but which disappear by the use of the new instrument.

It may, perhaps, be thought, that the Screw Tourniquet has some advantages over the present one after amputation, inasmuch as the blood-vessels may so easily be discovered by the gradual reversal of the screw. But the same result can be attained, by a very slow relaxation of the elastic band, and then tightening it again; and this may be done with even greater facility, and less trouble and risk, than with the screw.

#### USE OF THE ELASTIC TOURNIQUET IN THE TREATMENT OF ANEURISM.

The treatment of aneurism by compression dates back to the close of the 17th century. The pressure was then made directly on the sac, and many cures were made by this mode of treatment; but it proved to be not only uncertain, but dangerous, owing to the irritation and inflammation set up in the sac: hence it fell into comparative disuse. A modification of the plan was afterward introduced by the French surgeons, by laying open the sac and making pressure directly on the ends of the vessels. These methods were replaced in the last century by the Hunterian method of ligating the artery affected, which was found to be easier and



more successful. In 1810, Pelletan and Dubois first tried the plan of making pressure on the artery above the sac, instead of upon the aneurism itself; but the Dublin surgeons, Bellingham, Hutton, etc., first established the true principles on which this treatment by compression rests, and gave it a definite place in surgery. They showed that it was not necessary *to arrest the whole flow of blood* through the main artery leading to the sac, by making such a degree of pressure as to set up inflammation in the vessel; thus causing its obstruction by the effusion of lymph. The opposite view had, before this time, led to such forcible pressure as to cause great pain, and often leave sloughing of the skin, and other unpleasant results, in consequence of which, the treatment was almost wholly abandoned. It was now clearly established, that it was only necessary *to lessen* the quantity and force of the blood in the vessel, by a *moderate degree* of compression, and the cure was effected by the deposit of stratified fibrin in the sac, and its consequent consolidation, aided by the contraction of its walls. The formation of laminated fibrin in the sac would, indeed, seem to require the presence of a certain amount of blood, and it is found in these cases, where a cure has resulted, that the artery is in no way injured or obliterated.

It is only necessary to make *moderate, but steady and uniform, pressure* on the main artery leading to the sac, to effect a permanent cure; but it will be facilitated by making moderate pressure, also, on the tumor itself. This can be done by adapting to its entire surface a piece of tin or sheet lead, fitting closely, and then applying the pad over it; thus making the uniform and moderate pressure required. If the aneurism be *popliteal*, the pad of the other instrument should be applied about the middle of the thigh, and the limb placed on pillows, the patient being confined to a lounge or bed. The same course would be proper if the aneurism be seated anywhere in the lower extremities. The compression exerted on either of the pads should be but very moderate. The advantage of this instrument over "Dupuytren's Compressor," "Charriere's," the "Horseshoe Tourniquet," or "Petit's," in such cases, consists in its greater simplicity and more ready adaptation, more accurate adjustment of the compressing force, avoiding an in-

jurious degree of pressure, better accommodation to the limb, and especially in substituting an elastic force for the unyielding pressure of the screw, as it has been found that the pressure of a weight of four pounds, laid on the artery as it passes over the pubis, is sufficient to control the circulation through the vessel sufficiently, and as each turn of the vulcanized India-rubber band, fully extended, makes a pressure of at least that amount, and occasions scarcely any inconvenience whatever, it will be seen how well adapted this instrument is for the management of such cases. It is now well known that the pressure or force required to arrest the flow of blood in an artery is comparatively trifling to what was formerly supposed; and Macleod remarks, that "Guthrie did good service to surgery by showing *how small a force* can obstruct a vessel of the first order. He thereby gave courage and confidence to both surgeon and patient."—(*Notes on the Surgery of the War in the Crimea*," by G. H. B. Macleod, M. D. London, 1858.)

The chief point requiring attention is, to control the circulation sufficiently with the minimum of pressure. This may be done by one tourniquet, over the main artery, or two instruments may be employed, one over the tumor to approximate its sides, the other at a convenient distance from it to lessen the amount of blood passing through the artery, the pressure made by each may be less than if only one is employed. The pressure over the tumor should be just sufficient to check all pulsation, but not so much as to arrest all circulation through it. If any pain should result from the pressure of either instrument, one may be loosened for a time, and, if necessary, the other, perhaps, tightened; thus *alternation of pressure* can be kept up without much pain or inconvenience, and this can be done by the patient himself after proper instruction. The pressure need never be sufficient to prevent sleep; if it should be, it must be lessened. One, or even both pads, may occasionally be removed entirely, for a time, without preventing consolidation of the sac. This solidification, however, of the sac, however produced, is necessarily attended with more or less pain, and constitutional disturbance, which may require opiates, or other remedies.

The duration of the treatment varies considerably in different

cases, from a few hours or days to three months or more, depending on the constitution of the patient, state of the tumor, etc. The average time is about eighteen days, where continuous pressure is kept up.

This treatment is chiefly applicable where the aneurismal tumor is situated in the arteries of the lower extremity, below the middle of the thigh. When it is situated near the trunk, as in the iliac, carotid, subclavian, and axillary arteries, it is of course entirely inapplicable. It might be employed with advantage in aneurism of the brachial artery. It will be seen that the objections which have heretofore been raised against the treatment of certain aneurisms by compression, are chiefly, if not altogether, obviated by the use of this instrument.

As to the comparative success of the two methods, as hitherto employed, *i. e.*, of compression and ligature, even when very objectionable modes of pressure have been employed, statistics show a vast preponderance in favor of the treatment by compression; inasmuch as we avoid, by this plan, all danger of gangrene, erysipelas, secondary hemorrhage, etc. And even should compression fail, we may then resort to the ligature, and even with better chances of success than if it had not been employed; inasmuch as the pressure causes an enlargement of the collateral vessels, thus lessening the tendency to gangrene. Besides, there are many cases where the disease occurs in broken and unhealthy constitutions, or complicated with heart disease, where the ligature would be inadmissible. In all ordinary cases, then, of femoral, popliteal or brachial aneurism, compression by the "Elastic Tourniquet" will be, at least, equally expeditious, and far safer and more successful than treatment by ligature.

#### THE USE OF STYPTICS AND ASTRINGENTS, FOR THE PURPOSE OF ARRESTING HEMORRHAGE FROM WOUNDS ON THE BATTLE-FIELD AND IN CIVIL SERVICE.

To restrain hemorrhage from wounds, &c., *styptics* have always been more or less extensively employed. In former times they were relied on almost exclusively; but from the fact that they nearly all, certainly the more powerful, produce a more or less

stimulant impression, and thus frequently lead to inflammation, suppuration, and a tedious cure, they probably, on the whole, do more harm than good; they certainly should never be employed where it is preferable to avoid their use. The only cases in which they can be recommended, are certain capillary hemorrhages, as where refrigerants have failed, and the other means of arresting the flow cannot be readily brought to bear. The French surgeons employed to some extent, during the late Crimean war, solutions of the persulphate, pernitrate and the sesquichloride of iron, injecting them into wounds, &c.; and the same practice has been recommended and resorted to by some of our army surgeons during the present civil war. Thus, Dr. F. H. Hamilton, U. S. A., in his recent work on military surgery, speaks of injecting the *persulphate of iron*, diluted one half or more, into a deep wound, by a syringe, or applying it undiluted on an open bleeding surface; at the same time, he states that he has seen it, thus injected, produce erysipelatous inflammation. But whether these preparations of iron, &c., do produce violent inflammation or not, they will certainly prevent union by the first intention, and thus delay the cure. This treatment is not only coarse and unscientific, but highly dangerous. If used at all, they should be chiefly used in bleeding from spongy parts, and from cavities and organs to which other applications cannot readily be made. The following extract from a letter recently received by the writer, from Dr. Powers, Assistant Surgeon, 75th Regiment N. Y. Volunteers, at Fort Pickens, will serve to show the danger of applying powerful chemical styptics in deep-seated wounds:—"One of our men, a private of the 6th, was wounded in the calf of the leg with a piece of shell. The wound seemed but trifling when they brought him into the hospital; but as the hemorrhage was somewhat profuse, the surgeon of the 6th enlarged the opening, and applied perchloride of iron. The next day the foot grew cold, the pulse rapid, and there was some delirium. Stimulants were given freely, but the next day extensive gangrene of the leg came on, when the limb was amputated at the middle of the thigh; but the poor fellow never rallied, and died in an hour and a half. On examination, the peroneal artery was found to be divided, and a small piece chipped off the neck of the fibula."

"Blood stanching with styptic remedies," says Chelius, "is uncertain, and as regards the healing of the wound very injurious." Again, he remarks:—"The objection to styptics, of whatever kind, is that sloughing to a greater extent occurs after their use, than after the mere application of pressure.—(*Surgery*," Ed. by South. Am. ed., p. 333.)

The above remarks apply only to the chemical styptics, such as the salts of iron and the other metals; alum, creosote, turpentine, &c. Those that act mechanically, such as compressed sponge, agaric, cobweb, hat and hare's fur, lint, dry powders, &c., which adhere to the bleeding surface, and, being porous, allow the serous portions of the blood to drain away, but retain the fibrinous, thus hastening coagulation, are not liable to the same objections. They are, however, only useful when small vessels are wounded, and are always uncertain and unreliable. In all cases, compression by the Elastic Tourniquet will be found easier, more certain, and far more successful. As to other measures for checking hemorrhage, such as the actual and potential cautery, refrigerants, &c., they are only of exceptional use even in civil practice: on the battle-field they are of no use whatever.



## TESTIMONIALS.

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NEW-YORK, *Dec. 13th*, 1861.

I have been shown this evening an original invention, by Dr. Lambert, for the saving of soldiers' lives. It is a new contrivance for arresting the flow of blood from the arteries of the extremities, and the value of the invention is, that the wounded man himself can apply it.

The Common Tourniquet, the "Stick" and "Clamp Tourniquet," require a second person to assist in their application; and before this can be rendered, an abundance of soldiers have and will continue to perish from the loss of blood. Besides which, Dr. L.'s is much more compact and portable. While the circulation through the principal arterial channels is interrupted by this instrument, the collateral supply will go on to a sufficient extent to prevent the limb from perishing.

Every officer in our army, from the lowest grade to a general, should have one, and at his leisure moments, teach the men of their regiments how they are to be applied.

VALENTINE MOTT, M. D.,

*Professor of Surgery in the University of New-York.*

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NEW-YORK, *Dec. 13th*, 1861.

I concur entirely with Prof. Mott as to the practical value of Dr. Lambert's Tourniquet.

WILLIAM H. VAN BUREN, M. D.,

*Professor of Anatomy in the University of New-York; late Surgeon to New-York City Hospital and U. S. A.*

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NEW-YORK, *Dec. 14th*, 1861.

Dr. T. S. Lambert, of New-York, has just exhibited to me a Tourniquet of his own invention. I am very favorably impressed with its utility, and it seems to me, every soldier in the field should be furnished with one, as a most important "LIFE PRESERVER."

WILLARD PARKER, M. D.,

*Professor of Surgery in the College of Physicians, of New-York.*

No. 2 IRVING PLACE, N. Y., }  
12 mo., 15th, 1861. }

TO WHOM IT MAY CONCERN :

I have had the satisfaction of examining a Tourniquet or Compressor, the object of which is to arrest the flow of blood through the arteries of the extremities ; an instrument entirely new, and particularly well adapted for this purpose, and superior to any that I have ever seen, because of its easy adaptation by the patient, and at the same time arresting hemorrhage in case of wounds of arteries, without interruption of the collateral circulation in the limb to which it may be applied ; which is a great desideratum to the military surgeon.

I have no hesitation in saying that every regiment should be bountifully supplied with it. I have been permitted to read Dr. Mott's opinion of it, and concur in all that he has said.

JAMES R. WOOD, M. D.,  
*Professor of Surgery in Bellevue Hospital Medical  
College, of New-York, &c.*

STATE OF NEW-YORK, SURGEON-GENERAL'S OFFICE, }  
ALBANY, February 6th, 1862. }

I have examined with care the Tourniquet presented by Dr. Lambert, and most cheerfully concur in the opinion of its merits as expressed by Drs. Mott and Parker.

S. OAKLEY VANDERPOEL, M. D.,  
*Surgeon-General.*

BALTIMORE, January 22d, 1862.

Dr. Lambert has submitted for my examination a new Tourniquet, of which he is the inventor. I have examined it with that care and interest that its great importance demands, and I feel it due to the value of the instrument to give it my decided approbation. The principle is different from any other in use, and presents important advantages for the saving of life, in cases of wounds and sudden hemorrhage, either on the field of battle or in civil life.

It is also admirably adapted to the successful treatment of aneurism, varicose veins, and other surgical affections, where pressure is indicated. I feel it a duty to humanity to commend this valuable invention to the profession and the people.

J. W. R. DUNBAR, M. D.,  
*Prof. of Surgery, University of Maryland.*

BELLEVUE HOSPITAL MEDICAL COLLEGE, }  
NEW-YORK, Dec. 18th, 1861.

Dear Sir :—

I have carefully examined the new *Field Tourniquet* invented and constructed by yourself, and have compared it with the *Field Tourniquet* used by our army during the Mexican war, and also with the one since introduced and now in use in the service.

It has important advantages over both these. It is efficient, simple, portable, can be applied by the wounded man himself; and has this most important advantage, that, while it controls the main artery, *it interferes less with the collateral circulation.*

Very respectfully, your obedient servant,

T. CHILDS, M. D.,

*Prof. of Surgery, Berkshire Med. Coll., Mass.,  
and of Anat., Bellevue Hospital Med. Coll.,  
and late Asst. Surg. 1st Mass. Volunteers.*

DR. LAMBERT, etc.

NEW-YORK, Dec. 13th, 1861.

I have examined Dr. Lambert's new "*Elastic Tourniquet*," and believe it to be well adapted for use in military surgery, on account of its simplicity, and the rapidity with which it can be applied.

ALFRED C. POST, M. D.,

*Prof. of Surgery in the University of New-York.*

BOSTON, March 1st, 1862.

DR. T. S. LAMBERT :—

Sir,—Your portable Tourniquet has several new features, and will serve, as I think, a good purpose if introduced into the army.

Your obedient servant,

HENRY J. BIGELOW, M. D.,

*Professor of Surgery and Clinical Surgery,  
Harvard University.*

LOWELL, MASS., March 2d, 1862.

I have examined a Tourniquet recently invented by Dr. T. S. Lambert, and am satisfied that it is the best instrument of the kind now in use.

G. KIMBALL, M. D.,

*Late Brigade Surgeon, and Prof. of Surgery in  
Berkshire Med. Coll.*



SALEM, MASS , *March 3d*, 1862.

I have examined with much interest the Tourniquet invented by Dr. Lambert.

It combines in a remarkable degree the principles of security and facility of application, and must be invaluable to the military surgeon. I am glad to learn that it is about to be supplied to our armies in the field, where I have no doubt it will be the means of saving many lives.

EDWARD B. PEIRSON, M. D.,  
*Surgeon, etc., etc.*

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PHILADELPHIA, *Feb. 12th*, 1862.

Dr. Lambert, of Peekskill, New-York, has shown me an ingenious Tourniquet of his own invention, for the use of army surgeons, and of soldiers wounded on the field of battle. From a careful examination of the instrument, I am satisfied that it is a very valuable one, and therefore hope it may be extensively introduced among our troops.

S. D. GROSS, M. D.,  
*Professor of Surgery in the Jefferson Medical College,  
and author of Works of Surgery, and Military  
Surgery, etc., etc.*

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BOSTON, *Feb. 28th*, 1862.

Dr. Lambert has shown me a Tourniquet for field use, which I have examined, and it appears to me to contain the necessary requisites for that purpose, being portable and efficient. I should consider it a very valuable instrument in military surgery.

J. MASON WARREN, M. D.,  
*Surgeon to Mass. General Hospital, etc.*

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PROVIDENCE, R. I., *Feb. 28th*, 1862.

I have examined the Tourniquet invented by Dr. Lambert, and think it well adapted to its intended uses.

USHER PARSONS, M. D.,  
*Late Surgeon U. S. Army.*

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NEW HAVEN, CONN., *Feb. 27th*, 1862.

We have examined an "*Elastic Field Tourniquet*" invented by Dr. Lambert, and am satisfied that it is well adapted for use, as it is easily applied, and when properly applied, will prove efficient.

J. KNIGHT, M. D.,  
*Professor of Surgery, Medical School of Yale College.*  
CHARLES HOOKER, M. D.,  
*Professor of Anatomy, Yale College.*

• WOMAN'S HOSPITAL, NEW-YORK, *March 16th, 1862.*

I consider Doct. Lambert's Tourniquet absolutely perfect, and think it must necessarily supersede all others now in use.

J. MARION SIMS, M. D.,  
*Physician in Chief to the Woman's Hospital of New-York.*

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MASS. STATE PRISON, WARDEN'S OFFICE,  
CHARLESTOWN, *March 1st, 1862.*

The prompt arrest of hemorrhage when the wound is received, will not save the life of the soldier at that time only, but will, by economizing the vital fluid, greatly improve his chance of ultimate recovery after the interposition of surgical aid.

The Tourniquet so modified by Dr. T. S. Lambert, being simple in its construction, and of easy application by the soldier himself, is admirably adapted to promote these two important ends, and likewise, by its gentle but firm pressure, to allay that spasmodic twitching of the muscles of the mangled limb, so distressing to the wounded.

A. B. BANCROFT, M. D.,  
*Physician Mass. State Prison.*

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SING SING, *March 15th, 1862.*

This is to certify that I have carefully examined, and applied the new field or army Tourniquet of Dr. Lambert. I regard it as infinitely superior to any of the numerous instruments for arresting hemorrhage, which I have examined, both modern and ancient. It answers all the indications, combining the qualities of efficiency, easy applicability, extreme simplicity, compactness, cheapness and economy, and the great desideratum of conserving the collateral and capillary circulation, and hence the vitality of the limb.

It must be of incalculable value in the battle-field and army hospital. It is so simple that any of our half million of intelligent soldiers can apply it after a moment's instructions, which should be made an essential part of military tactics. The army should be liberally supplied with these "life preservers," as a humane counterpart to the death-dealing instruments which all are engaged in using. It is my opinion that one should be supplied for every ten men, with printed directions for use, and that every man should be "drilled" in its application.

It must also prove of great value in treating all cases of aneurisms, or other surgical diseases requiring compression.

Respectfully,

G. J. FISHER, M. D.,  
*Hospital Surgeon of the 7th Brigade, 2d Division, N. Y. S. M.*







